



## Drug Delivery Systems

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### Introduction

Drug delivery systems are engineered technologies for the targeted delivery and/or controlled release of therapeutic agents. Drugs have long been used to improve health and extend lives. Drug delivery systems control the rate at which a drug is released and the location in the body where it is released. Drug delivery systems control the rate at which a drug is released and the location in the body where it is released. Recently, there are a number of outstanding applications of the nanomedicine (chemotherapeutic agents, biological agents, immunotherapeutic agents etc.) in the treatment of various diseases.

Clinicians historically have attempted to direct their interventions to areas of the body at risk or affected by a disease. Depending on the medication, the way it is delivered, and how our bodies respond, side effects sometimes occur. These side effects can vary greatly from person to person in type and severity. Medications can be taken in a variety of ways—by swallowing, by inhalation, by absorption through the skin, or by intravenous injection.

### Classifications

#### 1. Oral drug delivery system:

These are mostly solids and based on dissolution, diffusion or both mechanisms in the control of release rate of drugs.

#### 2. Dissolution controlled drug delivery system:

Obtained by slowing dissolution rate of the drug in GI medium by incorporating the drug in an insoluble polymer and coating drug particles or granules with polymeric materials of varying thickness.

#### 3. Diffusion controlled drug delivery system:

Diffusion of a drug molecule occurs thorough the polymeric membrane and manufactured either by encapsulating drug particle in the polymeric membrane or dispersing in the polymeric matrix.

#### 4. Dissolution-Diffusion controlled drug delivery system:

Drug core is enclosed in a partially soluble membrane. Pores are created due to dissolution of parts of the membrane.

#### 5. Osmotic pressure controlled systems:

Movement of solvent from lower concentration of solute towards higher concentration of solute thorough a semi permeable membrane.

### Routes of Administration

1. Ophthalmic drug delivery system
2. Transdermal drug delivery system
3. Nasal drug delivery system
4. Intra-vaginal drug delivery system
5. Intra-vesical drug delivery system
6. Urethral administration
7. Mucosal drug delivery system.

New drug delivery systems include lipidic, proteic and polymeric technologies to provide new sustained drug delivery with better body distribution, drug protection from harsh external environment and avoidance of drug clearance. Drug targeting to specific organs and tissues has become one of the critical endeavors of the new century. The search for new drug delivery approaches and new modes of action represent one of the frontier areas which involves a multidisciplinary scientific approach to provide major advances in improving therapeutic index. A number of drug delivery systems are currently under investigation to circumvent the limitation commonly found in conventional dosage forms and improve the potential of the respective drug.

Glioblastoma multiforme (GBM), as grade IV brain tumors, have become an eminent threat in recent clinical practice. Inhibitors of apoptosis proteins (IAP) have been identified as an effective target to activate the apoptosis of cancer cells and overcome chemotherapy resistance. The measurement of Trans-Epidermal Water Loss (TEWL) allows to evaluate the integrity of Stratum Corneum Epidermis (SCE) barrier after topical application of colloidal Nano carriers by using a non-invasive method. The temporarily modifications of SCE lipids are important for the passage of colloidal Nano carriers across the skin; this passage causes a modification of TEWL values. Particular focus is set in essential aspects related to vaginal mucoadhesive materials and drug delivery systems. The most traditionally used vaginal dosage forms comprise suppositories, tablets, capsules, gels, creams and liquids (solutions or lotions), and have been mainly used as vehicles for drugs such as anti-infective agents or contraceptives. Drug delivery is essential for the treatment of chronic conditions. Implantable site-specific drug delivery devices offer direct delivery to the site of therapy, improving treatment outcomes while reducing side effects and overall associated healthcare costs.

Novel drug delivery system is a novel approach to drug delivery that addresses the limitations of the traditional drug delivery systems. Pharmaceutical development of drug delivery system is being pursued enthusiastically in many laboratories in India. These are being investigated in vitro for release pattern and in some cases in vivo in animals for pharmacokinetics but less frequently for efficacy.

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